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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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1	WHC-SD-EN-DP-085		0	1993 Borehole Completion Data Package, Grout Treatment Facility Wells 299-E25-49, 299-E25-50, and 299-E25-1000	3 3/24/94	1,4	1	

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1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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1	1	Cog.Eng. L. C. Swanson 3/24/94 H6-06	Central Files (2) L8-04	3	
1	1	Cog. Mgr. R. L. Jackson 3/28/94 H6-06	EPIC (1) H6-08	3	
1,4	1	QA W. R. Thackaberry 3.28.94 H4-16	ERC (2) H6-07	3	
		Safety			
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L. C. Swanson 3/24/94 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	R. L. Jackson 3/28/94 Cognizant/Project Engineer's Manager Date	[] Approved [] Approved w/comments [] Disapproved w/comments

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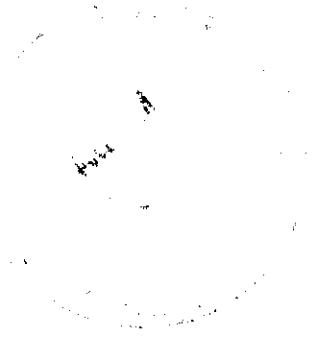

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Patent - General Counsel	[X]	[ ]	Not Rqd per OS: Memo 2/4/93 JC Swanson 3/22/94
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Information conforms to all applicable requirements. The above information is certified to be correct.

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Responsible Manager (Printed/Signature) / Date: R. L. Jackson R Jackson 3/28/94

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SUPPORTING DOCUMENT

1. Total Pages 207

2. Title

1993 Borehole Completion Data Package, Grout Treatment Facility Wells 299-E25-49, 299-E25-50, and 299-E25-1000

3. Number

WHC-SD-EN-DP-085

4. Rev No.

0

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borehole, RCRA, monitoring wells, Grout Treatment Facility

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6. Author

Name: L. C. Swanson

L C Swanson

Signature

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7. Abstract

WHC, 1994, *1993 Borehole Completion Data Package, Grout Treatment Facility Wells 299-E25-49, 299-E25-50, and 299-E25-1000*, WHC-SD-EN-DP-085, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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9. Impact Level NA

10. RELEASE STAMP

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CONTENTS

APPENDIXES:

FIGURE:

1.0 INTRODUCTION

Three new wells were installed at the Grout Treatment Facility (GTF) during 1993 in support of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1991), Milestone M-24-05. This data package contains information and data on well drilling, completion, and development, plus sample pump installation and aquifer testing for the upgradient well 299-E25-1000 and downgradient wells 299-E25-49 and 299-E25-50. Figure 1 shows the location of each new well in relation to the GTF and the existing groundwater monitoring network.

The groundwater monitoring plan for the GTF (WHC 1989) and the Generic Well Specification for Project W-152 (WHC 1993) provide the requirements and guidelines for the location and justification of wells 299-E25-49, -50, and -1000. Wells were constructed in conformance with the Washington State Department of Ecology (Ecology) (Ecology 1989a, 1989b, 1990).

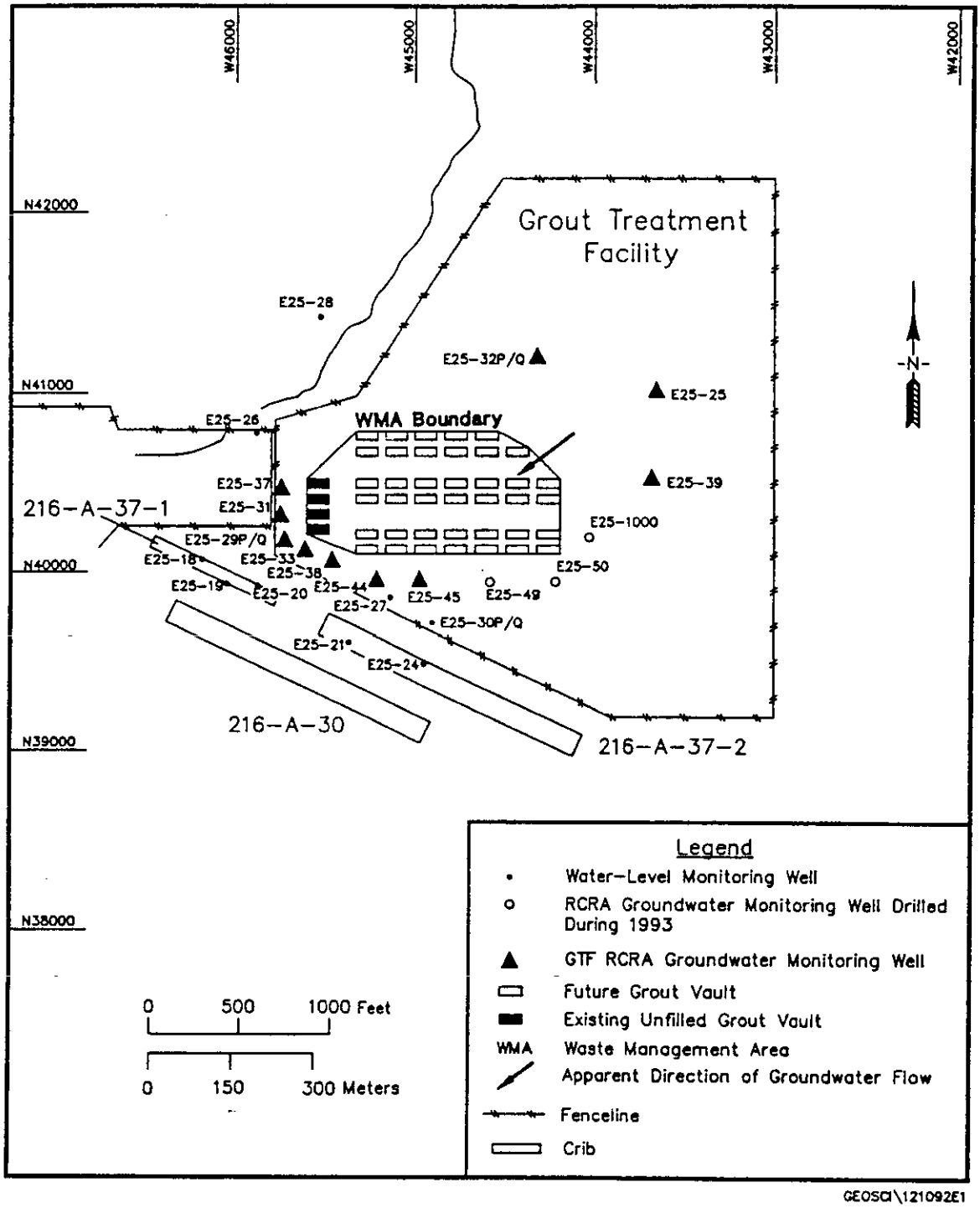
The GTF is in a detection monitoring program in accordance with *Resource Conservation and Recovery Act of 1976* (RCRA) interim-status requirements for establishing a groundwater monitoring program (EPA 1989). The recently completed wells are the current additions to the GTF monitoring well network.

The following information is included in the appendixes:

- Appendix A
  - Well summary sheet
  - Well construction report
  - Well survey data
  - Borehole logs
  - Well construction verification report
  - NaI gamma-ray borehole survey
  - Nonconformance reports
  - Geophysical logs
- Appendix B
  - Calcium carbonate and moisture content data
  - Radiation analysis data
- Appendix C
  - Well development form
  - Equipment configuration and wellhead diagram
  - Development drawdown/recovery form and data
  - Pump installation form.

The well location was approved by Ecology. Specific procedures for well drilling, completion, development, sampling, and reporting and record-keeping are outlined in the *Environmental Investigations and Site Characterization Manual* (WHC 1988).

Figure 1. Location Map for Boreholes.



2.0 BOREHOLE INFORMATION

2.1 GENERAL DRILLING INFORMATION

Three boreholes were finished during 1993. All were drilled using an air circulating drilling method. The system uses a top-drive air rotary drilling rig in combination with a downhole percussion hammer equipped with a special bit and and eccentric swing-out under reamer and a surface casing hammer. Compressed air moves through the hammer and provides a circulation medium to remove cuttings from the bit face. The use of air instead of water-based drilling media minimizes changes to the in situ hydrologic and chemical properties of the formation.

Air was supplied from a high-pressure, 220 lb/in^2 air compressor and was passed through a filtration system before introduction into the borehole. Oil, water droplets, and other possible contaminants down to 0.01 microns were removed from the air via the manufacturers 99.99% efficient system. The downhole hammer was lubricated with a nonhydrocarbon-based oil (U.S. Environmental Protection Agency established standard).

Cuttings and dust were controlled with a self-contained cutting control system. Cuttings were routed from a diverter head through flexible hose and into a cyclone separator where the larger cuttings are removed. The remaining smaller particles and dust are passed through a filter cartridge dust control system, where the air is finally purified by a high-efficiency particulate air filter before release to the atmosphere.

Samples were collected at a port located on the lower side of the cyclone separator; samples were retained in a sampling sock. The drilling method allows continuous sampling, as desired, and an accurate correlation of the sediments. Samples were generally acquired every 5 ft downhole for lithologic description, and laboratory testing for moisture content, calcium carbonate content, and radioactivity. Split spoon samples were collected where more detailed lithologic and stratigraphic information was desired. Sieve analyses were not performed on any samples.
All samples are archived at the Hanford Geotechnical Sample Library in the 2101-M Building.

During drilling, the wellhead and borehole discharge were monitored onsite with radiation detection meters and organic vapor analyzers. Onsite conditions were maintained below any health/safety action levels, at all the sites.

All cuttings and purgewater from the boreholes were contained and disposed in accordance with Westinghouse Hanford Company procedures. Temporary carbon steel casing was used to keep the hole open while drilling. Nonpetroleum-based lubricants were used on the tools and drill string.

2.2 WELL 299-E25-49

2.2.1 Drilling

Drilling well 299-E25-49 began August 5, 1993, and continued until August 27, 1993, when total depth was reached at 292 ft below land surface (bls). Static water level was established at 272.3 ft bls, following well completion. The well summary sheet in Appendix A provides an as-built diagram that graphically illustrates the final well configuration with a brief description of the borehole geology. The borehole log in Appendix A provides a detailed lithologic description of the sediments, graphically illustrates the geology, and indicates the sample depth and method.

Natural-gamma and potassium-uranium-thorium (KUT) geophysical probes were used to record borehole data with the completion of each string of casing; this was not done after the 12 ft of 12-in.-diameter surface casing. The 10-in.-diameter casing was seated at 158 ft, and subsequently probed from 3.1 to 157.2 ft with the gamma probe and 2 to 153 ft with the KUT on August 18, 1993. The 8-in. casing went to total depth (292 ft) and the gamma (September 1, 1993) was recorded from 135 to 292 ft bls, whereas the KUT (August 31, 1993) recording was from 0 to 292.45 ft bls. Geophysical logs from these surveys are available in Appendix A.

Approximately 100 gal of raw Columbia River water was added to the borehole to facilitate drilling from 282 to 293 ft bls; the water was an attempt to stabilize a heaving sand near the completion depth. Approximately 1,600 gal of raw Columbia River water was added to the borehole during the well completion process.

Split spoon samples were collected for more detailed lithologic and stratigraphic information; sampling intervals are 97.77 to 99.77 and 157.4 to 159.4 ft bls. Analytical results for the soil samples are presented in Appendix B.

2.2.2 Well Completion

A permanent 4-in.-diameter, type 304 stainless steel screen (10 slot, or 0.10 in.) was installed atop 3.5 ft of 20-40 mesh Colorado silica sand. While backpulling the temporary casing with hydraulic jacks, 20-40 silica sand was used to fill the annular space to a depth of 264 ft bls. Factory-welded centralizers were placed approximately every 40 ft along the 20-ft joints of permanent type 304 stainless steel riser pipe. Total riser length measured 273.09 ft, which includes 3.92 ft of stickup. The water level during the completion process was 272.19 ft bls and was measured at 272.3 ft bls on September 10, 1993.

Backpulling the temporary casing, 1/2-in. bentonite pellets were placed atop the silica sand from 264.0 to 256.4 ft bls to form an annular seal. The remaining annular space was filled with granular bentonite to 12.0 ft bls. The borehole was sealed to 2 ft bls with Portland Cement Grout and capped with a concrete pad. A 6-in.-diameter protective casing, locking cap, and four protective posts completed the surface installation. The well was surveyed November 16, 1993 (Appendix A data).

2.2.3 Well Development and Sample Pump Installation

Well 299-E25-49 was developed on September 24, 1993, with a submersible electric pump and a transducer. Groundwater was pumped at a flow rate of 9.56 gal/min. A total of 1,693 gal of water was removed from the well before reaching a turbidity value of 4.0 nephelometric turbidity units (NTU). All development water was contained. The results of the well development tests are summarized in Appendix C.

The submersible pump was then removed from the well and a permanent Hydrostar (a trademark of Instrumentation Northwest, Inc.) sampling pump installed on September 24, 1993. The sampling pump intake was set at 286.99 ft below the top of the 6-in. casing, about 14.5 ft below the water table. The development logs and pump installation data are presented in Appendix C.

2.3.4 Aquifer Testing

Following well completion, no slug tests were performed due to highly transmissive formations.

Water-level changes were also monitored in well 299-E25-49 during well development using a transducer and data logger system. Groundwater was discharged at a constant rate from the well at 9.56 gal/min for 82 min, at which time the development criteria of $\leq$5 NTU was achieved and pumping terminated. Appendix C contains test data and information sheets for the instantaneous slug tests and the well development.

2.2.5 Test Analysis

Aquifer test data were not analyzable for the slug and development testing because of the very small water-level changes that occurred. The maximum recorded drawdown was only 0.10 ft during the development test. Figures showing the drawdown responses during these tests are in Appendix C.

These types of observed responses are evidence that high transmissivities are present at this well. High transmissivities (>100,000 ft^2/d) are typical for the unconfined (uppermost) aquifer at the GTF, as demonstrated from past slug tests, constant discharge tests at other upgradient and downgradient wells, and the low hydraulic gradient (10^{-4} ft/ft) across the site (see DOE-RL 1988 for more detailed information).

2.3 WELL 299-E25-50

2.3.1 Drilling

Drilling began on August 6, 1993, and the boring was finished on September 11, 1993 at a depth of 294.2 ft bls. The surface/starter casing, 15.1 ft of 12-in. nominal temporary carbon steel, was emplaced with a backhoe. The bore was cased to 82 ft bls with 10 in., and the hole was cased to 293 ft bls with 8-in. nominal. The bore was geophysically logged (0-81.45 ft) with

the KUT probe on August 31, 1993, before telescoping the 8-in. casing; both the KUT (0-294.2 ft) and gross gamma (3.1-293.1 ft) were done on September 13, 1993. Copies of the geophysical data are in Appendix A. Approximately 100 gal of raw Columbia River water was added to the bore to stabilize the hole during backpulling. A static water level of 272.2 ft bls was acquired on September 17, 1993, as compared to 272.12 ft bls on the 10th of the same month.

The well summary sheet in Appendix A provides an as-built diagram that graphically illustrates the final well configuration and gives a brief description of the borehole geology. The borehole log, same appendix, presents a graphic display of the downhole geology, and includes the sample collection intervals plus detailed lithologic descriptions.

Samples were routinely collected every 5 ft downhole, and four specific split spoon intervals were sampled for more detailed information. Split spoon samples were taken from 83 to 85, 118.2 to 120.2, 268.8 to 269.85, and 279 to 281 ft bls, respectively.

2.3.2 Well Completion

Permanent 4-in.-diameter, type 304 stainless steel riser casing and continuous wire-wrap 20 slot (0.20-in.) screen were installed on September 14, 1993. Factory-welded centralizers were placed approximately every 40 ft along the 20-ft joints of permanent casing. Total screen and casing lengths measured 293.39 ft and include 3.69 ft of stickup above ground surface.

The bottom of the hole was filled with 4.5 ft of 10-20 silica sand, on which the screen was placed. While backpulling the temporary 8-in. casing, the 10-20 sand filled the remaining bore to 264.8 ft bls, at which point a 3.8-ft annular seal (the top at 261 ft bls) of 1/2-in. bentonite pellets was established. Bentonite granules, 8-20 mesh, were used as annular filling from 261 to 10.7 ft bls, where type I and II portland cement filled the space to 1.0 ft bls. Later, a surface pad of concrete is poured, into which a 6-in.-diameter protective casing and locking cap, plus four protective posts are set.

2.3.3 Well Development and Sample Pump Installation

Well 299-E25-50 was developed on September 27, 1993 with a submersible pump and a transducer. Groundwater was pumped at a flow rate of 9.34 gal/min. The turbidity target of <5 NTU was reached after pumping 2,800 gal over a 5-h period. All development water was contained. The results of the well development tests are summarized in Appendix C.

The development pump was then removed and a Hydrostar sampling pump installed. The sampling pump intake was placed at 287.86 ft below the top of the 6-in. casing on September 27, 1993. The development and pump installation data are presented in Appendix C.

2.3.4 Test Analyses

No slug test was performed due to a highly transmissive formation.

2.4 WELL 299-E25-1000

2.4.1 Drilling

The borehole was started on August 9, 1993, and finished on September 13, 1993. This borehole is an upgradient well and serves a dual function of characterizing the sediments to the basalt; a nonconformance report (NCR #050058) was issued for failure to characterize the sediments from 260 to 323 ft downhole. The drilled depth was 391.89 ft bls. Prior to commencing drilling operations, a backhoe was used to install 15.1 ft of temporary surface casing (12-in. nominal carbon steel). Total casing lengths of 178.6 ft of 10-in. and 378.9 ft of 8-in.-diameter carbon steel were used to reach total depth. All carbon steel casing is removed during the well completion process. No water was added to the bore to facilitate drilling; however, approximately 450 gal was used during completion.

The well summary sheet(s) in Appendix A provides an as-built diagram that graphically illustrates the final well configuration and gives a brief description of the borehole geology. The borehole log, in the same appendix, provides detailed lithologic information, a graphically illustrated version of the geology, and indicates the intervals at which sediment samples were collected.

Well 299-E25-1000 was KUT logged to 175 ft bls (inside the 10-in. casing) on September 16, 1993, before reducing to 8 in. The bore was logged again on October 12, 1993, with the KUT tool, after the termination of drilling. Geophysical logs are available in Appendix A.

Samples were routinely collected during drilling operations. Split spoon samples were attempted at seven intervals through the borehole: three were successful, one partial success, and three failed (in gravels). The successful samples were acquired at 88.67 to 90.42, 278.12 to 279.95, and 353.43 to 355.42 ft bls; the partial success was attained at the interval of 314.13 to 315.31 ft bls. These samples generated more specific lithologic and stratigraphic information. No sieve analyses were performed on any of the samples.

While drilling, the drill site, wellhead, and sediment samples were monitored with radiation detection meters and organic vapor analyzers. All meter readings were below health safety action levels.

2.4.2 Well Completion

Permanent 4-in.-diameter, type 304 stainless steel casing and 10 slot (0.10-in.), continuous wire wrap screen were installed on October 23, 1993. Factory-installed centralizers were installed every 40 ft along the 20-ft joints of permanent casing. A 30.3-ft end-cap and screen assembly, set from 263.3 to 293.6 ft bls, terminates the 294.67-ft-long colum, resulting in a

1.07-ft stickup. The static water level prior to the start of well development was 272.12 ft below the top of the 6-in. casing, or 268.17 ft bls.

Because of the depth of the borehole, 123 ft (+ or -) below the water table, the lowermost part of the hole was backfilled with bentonite pellets greater than 1/2 in. in size as the casing was being pulled; a filler of 10-20 mesh silica sand was set from 351.6 to 354.8 ft bls for its weight to maintain the integrity of the column. A landing pad of 10-20 sand was built from 297.5 to 293.4 ft bls, on which the screen rests. While continuing to pull the casing, 20-40 mesh silica sand filled the annular space from 293.4 to 258.5 ft bls, followed by bentonite pellets (3/8 in.) to 254.3 and the 1/2-in. pellets to 243.1 ft bls. Due to insufficient material within the casing, as the casing was pulled, the formational sands collapsed against the casing two different times (243.1 to 237.8, and 232.9 to 232.4 ft bls); this resulted in a nonconformance report (NCR #050961). The intervening segment and overlying 2.4 ft were filled with 10-20 sand, to 230 ft bls. Bentonite crumbles fill the annular space from 230 to 14.1 ft bls. Type I and II Portland cement grout fills the remaining annular space to the surface. Later, a concrete pad with a 6-in. protective casing fixed with a locking cap and four surrounding guard posts were installed.

2.4.3 Well Development and Sample Pump Installation

Well 299-E25-1000 was developed on November 8, 1993, with a submersible pump and a transducer. Groundwater was pumped at a flow rate of 20.0 gal/min; the pump operated for 61 minutes, pumped 1,835 gal, and had a turbidity of 1.20 NTU. Results of the well development are presented in Appendix C.

The submersible pump was removed, and a permanent Hydrostar sampling pump was installed on the same day. The pump intakes are set at 289.73 ft bls. Pump installation and configuration data are available in Appendix C.

2.4.4 Aquifer Testing

Slug tests were not performed on well 299-E25-1000 because of the highly transmissive formation.

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APPENDIX A

DRILLING AND CONSTRUCTION DATA

CONTENTS

Due to the large volume,
a copy of the data
supporting the Data
Validation Report and
the Sample Data Summary,

Pages A-3 thru C-40,

is available only from
Central Files.

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